

## CLAIMS

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### IN THE CLAIMS:

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1. A computer-implemented method for communication and cooperative task completion between a community of distributed electronic agents and at least one other distributed component system, the other distributed component system including a component registry providing access to a plurality of distributed components registered therein, the method comprising the acts of:

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receiving from a bridge agent a description of functional capabilities of the components registered in the component registry, the bridge agent being capable of translating between a dynamically expandable interagent communication language ("ICL") understood by the community of distributed electronic agents and an incompatible protocol understood by the distributed component system;

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adding to a facilitator registry of the community of distributed agents, in ICL format, a declaration of functional capabilities corresponding to the components registered in the component registry, on behalf of the bridge agent;

responsive to an ICL request for service, delegating an ICL sub-goal request to the bridge agent;

translating the delegated ICL sub-goal request into the incompatible protocol;

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invoking one or more of the distributed components via the component registry and the translated request in the incompatible protocol.

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2. An extensible computer implemented method as recited in claim 1, wherein the service request is generated by one of the components registered in the multiple component registry, the method further comprising the acts of:

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transmitting the service request to the bridge agent;  
translating the service request into the interagent communication language; and  
transmitting the service request from the bridge agent to the facilitator.

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3. An extensible computer implemented method as recited in claim 1, wherein the service request is received from an agent capable of communicating in the interagent communication language.

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4. An extensible computer implemented method as recited in claim 3, wherein the agent is independent of the multiple component registry.

5. An extensible computer implemented method as recited in claim 1, further comprising the steps of:

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receiving functional capabilities of one or more electronic agents independent of the multiple component registry;

adding the agent functional capabilities to the facilitator registry; and

selecting from the facilitator registry an agent capable of completing the request; and

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delegating the goal to the selected electronic agent.

6. An extensible computer implemented method as recited in claim 1, wherein the components registered in the multiple component registry are software based objects.

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7. An extensible computer implemented method as recited in claim 5, wherein the multiple component registry is a Distributed Object Service.

8. An extensible computer implemented method as recited in claim 6, wherein the multiple component registry utilizes Jini software.

9. An extensible computer implemented method as recited in claim 6, wherein the multiple component registry utilizes Corba software.

10. An extensible computer implemented method as recited in claim 6, wherein the multiple component registry utilizes Java software.

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11. An extensible computer implemented method as recited in claim 1, wherein the service request is received from a service requesting agent capable of communicating in the interagent communication language.

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12. An extensible computer implemented method as recited in claim 1 further comprising the act of periodically updating the facilitator registry.

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1585 13. An extensible, and highly scaleable computer-implemented method for communication and cooperative task completion among a plurality of electronic agents, the method comprising the acts of:

receiving a description of functional capabilities of a plurality of components registered in a multi component registry;

1590 translating the functional description through a bridge agent capable of translating between an interagent communication language and a language understandable by the multiple component registry;

transmitting the translated description to a facilitator;

1595 compiling a facilitator registry, in the interagent communication language, including the translated description of functional capabilities of the components registered in the multiple component registry;

receiving a request for service;

interpreting the request for service, the act of interpreting further comprising:

generating a goal necessary to accomplish the service request;

1600 selecting from the facilitator registry at least one component capable of completing the goal;

delegating the goal to the bridge agent, in the interagent communication language, with a request to invoke the service of the service of the selected component; and

1605 translating the delegated goal and request to invoke the service of the selected agent into a language understandable by the multiple agent registry.

1610 14. An extensible computer implemented method as recited in claim 13,  
wherein the service request is generated one of the components registered in the  
multiple component registry, the method further comprising the acts of:

transmitting the service request to the bridge agent;

translating the service request into the interagent communication  
language; and

transmitting the service request from the bridge agent to the facilitator.

1615 15. An extensible computer implemented method as recited in claim 13,  
wherein the service request is received from an agent capable of communicating in  
the interagent communication language.

1620 16. An extensible computer implemented method as recited in claim 13,  
further comprising the acts of:

receiving functional capabilities of one or more electronic agents the  
agents being independent of the multiple component registry;

adding the agent functional capabilities to the facilitator registry; and

1625 selecting from the facilitator registry an agent capable of completing  
the request.

1630 17. An extensible computer implemented method as recited in claim 13,  
wherein the components registered in the multiple component registry are software  
based objects.

1635 18. An extensible computer implemented method as recited in claim 17,  
wherein the multiple component registry is a Distributed Object Service.

1640 19. An extensible computer implemented method as recited in claim 18,  
wherein the multiple component registry utilizes Jini software.

1645 20. An extensible computer implemented method as recited in claim 18,  
wherein the multiple component registry utilizes Corba software.

1650 21. An extensible computer implemented method as recited in claim 18,  
wherein the multiple component registry utilizes Java software.

22. An extensible computer implemented method as recited in claim 13,  
wherein the service request is received from a service requesting agent capable of  
communicating in the interagent communication language.

23. An extensible computer implented method as recited in claim 13,  
further comprising the act of periodically updating the facilitator registry.

24. A software-based flexible computer architecture for communication  
and cooperation among a plurality of distributed agents and components, the method

contemplating leveraging an existing multiple component registry to utilize services of components registered therein, the architecture comprising:

1655 a bridge agent capable of bi-directional interpretation between an interagent communication language and a language understandable by the multiple component registry, the bridge agent being in communication with the multiple component registry and receiving from the multiple agent registry data including the functional capabilities of the components registered therein;

a service requesting agent capable of generating a request for service in the interagent communication language; and

1660 a facilitator capable of receiving from the bridge agent the functional capabilities of the components and registering such capabilities in a facilitator registry, the facilitator further capable of receiving the service request and operable to determine a goal necessary to answer the service request, select from the facilitator registry a component capable of accomplishing the goal and delegating the goal as a  
1665 specific component request to the bridge agent, whereby the bridge delegates the specific component request to the component registry to access the component.

25. A software based flexible computer architecture as recited in claim 24, wherein the components are software based objects and the multiple component  
1670 registry is a distributed object service.

26. A software based flexible computer architecture as recited in claim 25 wherein the distributed object service is based on Jini software.

1675 27. A software based flexible computer architecture as recited in claim 25 where the distributed object service is based on Corba software.

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28. A software based flexible computer architecture as recited in claim 26 wherein the distributed object service is based on Java software.

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29. A software-based flexible computer architecture for communication and cooperation among distributed electronic components, comprising:

a plurality of software based components;

a multi component registry containing functional capabilities of the components;

a service requesting component, capable of generating a request for service in the in the form of an object call readable by the multiple component registry; and

a facilitator, having a wrapper rendering such facilitator callable by multiple component registry in response to the service request generated by the service requesting component, the facilitator capable of receiving from the multiple component registry the functional capabilities of the components and registering such capabilities in a facilitator registry, the facilitator further capable of receiving the service request and operable to determine a goal necessary to answer the service request, select from the facilitator registry a component capable of accomplishing the goal and delegating the goal to the bridge agent, whereby the bridge delegates the specific component request to the component registry in the form of a second object call.

30. A software based flexible computer architecture as recited in claim 29, wherein the components are objects.

31. A software based flexible computer architecture as recited in claim 29, further comprising one or more service providing agents, and wherein the facilitator registry further includes the functional capabilities of the service providing agent, the



facilitator being further capable of sending delegating the goal to the service providing agent to accomplish the goal.

1705 32. A software based flexible computer architecture as recited in claim 31, wherein the service providing agent is independent of the multiple component registry.

1710 33. A software based flexible computer architecture as recited in claim 29, wherein the multiple component registry is a distributed object service and the components registered therein are objects.

34. A software based flexible computer architecture as recited in claim 33, wherein the distributed object service is based on Java software.

35. A software based flexible computer architecture as recited in claim 33, wherein the distributed object service is based on Jini software.

1715 36. A software based flexible computer architecture as recited in claim 33, wherein the distributed object service is based on Corba software.

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34. A computer based architecture as set forth in claim 29, further comprising:

1720 an electronic agent, the electronic agent being independent of the multiple component registry, and wherein the electronic service requesting agent generates the service request in the interagent communication language.

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35. A computer based architecture as set forth in claim 29, further comprising an electronic service providing agent capable of communicating in the interagent communication language, and wherein the registry compiled in the interagent communication language further includes the functional capabilities of the service providing agent, and wherein the facilitator is further operable to delegate the goal to the service providing agent in the interagent communication language.

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